

## CLAIMS

1. A random input multistage voltage trickle storage system is essentially comprised of:

- a DC source 100: related to a DC source comprised of a contact type conduction device and rectified city power for random coupling to supply DC power at random, or to a DC source from a solar cell, windmill generation or any other unstable DC source, or a DC source converted from AC source, such as that unstable DC source converted from tide or vibration energy;

- a circuit 101 to regulate and limit inputted electric energy: comprised of a diode or other one-way current transmission device or circuit, e.g., an electro-mechanical device, or a controllable power chip or a gate current, or other one-way current transmission solid state circuit device or circuit, to regulate and control voltage and amperage outputted from the DC source to a storage unit 102, and to ensure that the electric energy can only be outputted from the DC source 100 to each storage unit and output terminal as any input to the DC source 100 is prevented; and the circuit 101 is optional; and

- a storage unit 102: containing a first storage device 103 comprised of a capacity or a super capacity or a secondary battery, to be connected in parallel with the DC source 100 and output terminal, and the output terminal of the first storage device 103 may be further connected in series with an isolation diode 104 in the positive direction as required by the circuit; a second storage device 105 provided with a capacity, or super

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capacity, or a primary battery or a secondary battery,  
connected first in series with a one-way electric energy  
output limiting circuit 106, the in parallel with the  
power source and output terminal; a circuit 108 to  
5 regulate and control outputted amperage provided with  
the one-way electric energy output limiting circuit  
106 and comprised of a diode 107 or other one-way current  
transmission device or circuit, e.g., an  
electro-mechanical device or controllable power chip  
10 or gate current, or other one-way current transmission  
solid state circuit device or circuit, so to ensure  
that the secondary battery device can only output  
electric energy to the source side and load side  
connected in parallel as the electric energy input the  
15 secondary battery device is prevented; and a charging  
operation and control circuit 111 comprised of a  
positive bias of a diode 109, or a zener diode 110,  
or an electro-mechanical device or solid state circuit  
device, that is connected in parallel with both  
20 terminals of the one-way electric energy output  
limiting circuit 106, to operate and control setting  
up the voltage for the DC source to commence charging  
the second storage device 105, or to further limit its  
charging current and to convert its charging saturation  
25 to the status of maintaining charging or circuit  
breaking when the second storage 105 is comprised of  
a capacity, a super capacity or a (dis)chargeable  
secondary battery or other chargeable storage device;  
in practice, the charging control and operation circuit  
30 is optional.

2. A random input multistage voltage trickle storage system as claimed in Claim 1, wherein, an optional circuit for regulating voltage and amperage comprised of electro-mechanical device or solid state electronic device may be provided between the DC source 100 and the storage unit 102 to operate and control the voltage and current outputted from the DC source 100 for limit or constant voltage and limit or constant current to be outputted to the first storage device 103 of the storage unit 102, and if the optional isolation diode 104 is connected in series, such current and voltage is further outputted to the next stage of storage circuit connected in parallel and comprised of the second storage device 105 and the one-way electric energy output limit circuit 106 for further output.
3. A random input multistage voltage trickle storage system as claimed in Claim 1, wherein, an optional current regulation circuit comprised of electro-mechanical device or solid state electronic device is provided between the DC source 100 and the first storage device 103 of the storage unit 102, to execute operation and control of limit or constant current on the output from the DC source 100 before being further outputted to the first storage device 103 of the storage unit 102; and if the optional isolation diode 104 is connected in series, further outputted to the next storage circuit connected in parallel and comprised of the second storage device 105, the one-way electric energy output limit circuit 106 and a charging operation and control circuit 111 for further output.
4. A random input multistage voltage trickle storage system as claimed in Claim 1, wherein, an optional voltage

regulation circuit comprised of electro-mechanical device or solid state electronic device is provided between the DC source 100 and the first storage device 103 of the storage unit 102, to execute operation and control of limit or constant voltage on the output from the DC source 100 before being further outputted to the first storage device 103 of the storage unit 102; and if the optional isolation diode 104 is connected in series, further outputted to the next storage circuit connected in parallel and comprised of the second storage device 105, the one-way electric energy output limit circuit 106 and a charging operation and control circuit 111 for further output.

5. A random input multistage voltage trickle storage system as claimed in Claim 1, wherein, a zener diode 112 is directly connected in parallel with both terminals of the DC source 100 (a drop resistance may be connected in series before the connection of the zener diode 112 if required), then the isolation diode 113 is connected in series in the positive direction of the current before being outputted to the first storage device 103 of the storage unit 102, and if the optional isolation diode 104 is connected in series, further outputted to the next storage circuit connected in parallel and comprised of the second storage device 105, the one-way electric energy output limit circuit 106 and a charging operation and control circuit 111 for further output.

6. A random input multistage voltage trickle storage system as claimed in Claim 1, wherein, the isolation diode 113 is connected in series in the positive direction of the current with the DC source 100, then outputted to the first

- storage device 103 of the storage unit 102, and if the optional isolation diode 104 is connected in series, further outputted to the next storage circuit connected in parallel and comprised of the second storage device 105, the one-way electric energy output limit circuit 106 and a charging operation and control circuit 111 for further output.
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7. A random input multistage voltage trickle storage system as claimed in Claim 1, wherein, the zener diode 112 is directly connected in parallel with both terminals of the DC source 100 (a drop resistance may be connected in series before the connection of the zener diode 112 if required) then outputted to the first storage device 103 of the storage unit 102, and if the optional isolation diode 104 is connected in series, further outputted to the next storage circuit connected in parallel and comprised of the second storage device 105, the one-way electric energy output limit circuit 106 and a charging operation and control circuit 111 for further output.
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8. A random input multistage voltage trickle storage system as claimed in Claim 1, wherein, the capacity or super capacity 114 provides the storage function for the first storage device 103.
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9. A random input multistage voltage trickle storage system as claimed in Claim 1, wherein, the (dis)chargeable secondary battery provides storage function for the first storage device 103.
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10. A random input multistage voltage trickle storage system as claimed in Claim 1, wherein, the diode 107 is connected in series with the circuit 108 to regulate and control the outputted current, before being connected in parallel with
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the charging operation and control circuit 111 in the same direction of the current, and further connected in series with the second storage device 105 for the charging operation and control circuit 111 to control the charging current of the second storage device 105, and for the circuit 108 and the diode 107 to regulate and control its output current.

11. A random input multistage voltage trickle storage system as claimed in Claim 1, wherein, the circuit is comprised of the zener diode 115 while containing the functions of that from the charging operation and control circuit 111 and one-way electric energy output limit circuit 106; wherein, the zener diode 115 provides the functions of that from the charging operation and control circuit 111 and the one-way electric energy output limit circuit 106, within, the zener voltage function of the zener diode 115 is used to provide the function of the charging operation and control circuit to limit the voltage, and an output route is created by the diode effect in reverse direction of the zener diode 115.

12. A random input multistage voltage trickle storage system as claimed in Claim 1, wherein, the second storage device 105 is comprised of the capacity or the super capacity 116.

13. A random input multistage voltage trickle storage system as claimed in Claim 1, wherein, the second storage device 105 is comprised of any type of (dis)chargeable secondary batter 117.

14. A random input multistage voltage trickle storage system as claimed in Claim 1, wherein, the charging operation and control circuit 111 is not provided; instead, the second

storage device 105 is comprised of a primary or (dis)chargeable secondary battery or any other (dis)chargeable storage device.

15. A random input multistage voltage trickle storage system as claimed in Claim 1, wherein, both of the charging operation and control circuit 111 and the optional circuit 101 to regulate and limit the inputted electric energy are omitted; instead, the function of the one-way electric energy output limit circuit 106 is provided by the diode 107 and the second storage device 105 is comprised of a primary or (dis)chargeable secondary battery or any other (dis)chargeable storage device.

16. A random input multistage voltage trickle storage system as claimed in Claim 1, wherein, the system of the present invention is provided with a first storage device and a second storage device and the latter is comprised of a super capacity or a secondary charging batter of larger capacity, immediate operation upon start-up is possible in the presence of sufficient voltage from the second storage device; if such sufficient voltage from the second storage device is not available, the first storage device with the smaller capacity has the top priority to be charged by the solar cell to make start-up operation soonest possible disregarding how low the voltage from the first storage device; on the contrary, under the same conditions, a longer stand-by upon start-up is required in the conventional circuit for lacking in such random input multistage voltage trickle storage system, and the operator has to wait up its single high capacity storage device being charged to reach the working voltage.

17. A random input multistage voltage trickle storage system as claimed in Claim 1, wherein, during the longer subsequent period to receive the optical energy by the solar cell, the first storage device with lower storage capacity is first charged up to the preset voltage, then the second storage device is automatically and immediately charged for storage of more electric energy.
18. A random input multistage voltage trickle storage system as claimed in Claim 1, wherein, the first storage device 103, the second storage device 105, the one-way electric energy output limit circuit 106 and the charging operation and control circuit 111 allow the following options:
- the relationship of storage capacity among the storage devices is as follows: the storage capacity of the first storage device 103 < the storage capacity of the second storage device 105 < the storage capacity of the third storage device < ... and so on to constitute a multistage DC supply system of unstable source;
  - with the exception of the first storage device, the one-way electric energy output limit circuit 106 and the charging operation and control circuit 111 both have to be added in series with the second storage device and any storage device of subsequent stage;
  - the one-way electric energy output limit circuit 106 and the charging operation and control circuit 111 are connected in parallel, then respectively connected in series with the second storage device 105 and the third storage device or any subsequent storage device; so that after the first storage device 103 has been charged to its preset voltage, the charging is immediately and



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automatically provided to the second storage device 105; in turn, when the second storage device 105 is charged up to its preset voltage, the charging is immediately and automatically provided to the third storage device, and so on to constitute the random input multistage voltage trickle storage system;

- a charging source to first charge the first storage device 103, then the second storage device 105, and so to constitute the random input multistage voltage trickle storage system; and

- the one-way electric energy output limit circuit 106 and the charging operation and control circuit 111 are connected in parallel, then respectively connected in series with the second storage device 105 and the third storage device or any subsequent storage device so for the first storage device 103, the second storage device or any additional storage device of the subsequent stage.

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